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The Applications and Limitations of Manpower Forecasting;

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The Applications and Limitations of Manpower Forecasting

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The purpose of this paper is to undertake a general examination of the objectives, methodology, applications and limitations of manpower forecasting. The reason for this examination is to answer the question of what role manpower forecasting can play in the Canadian "war on poverty". 1 This paper will not examine the various poverty programs as such since it is our understanding that other papers at the conference will consider the present and proposed projects. Instead, our objective is to set the stage for considering the enlistment of manpower forecasting techniques in the war on poverty.

The paper is presented in six sections, each of which begins with the general aspects of manpower forecasting and then focuses on the relevant considerations for the poverty program. Section I sets out the final products of any manpower forecast. Here the question is asked: What do we mean by manpower forecasting? Section II examines the various reasons for undertaking a manpower forecast as well as the assumptions which underlie these reasons. Having presented the "what" and "why" of manpower forecasting the next step is the "how." In Section III we examine first the theoretically ideal approach and then focus on the technique which is used most often. This section is the longest in the paper containing in addition a discussion of the problems of data deficiencies. Sections IV and V tie the earlier parts of the paper together by examining first the applications and relevance of the results, and then the limitations. The paper concludes with a summary of the main points that emerge from an examination of the application of manpower forecasting techniques to programs designed to reduce poverty.

I WHAT DO WE MEAN BY MANPOWER FORECASTING?

Most manpower forecasts end up with the following products:

1. Estimates of future manpower requirements presented in one or two ways:

- a) the likely employment in a target year in certain industries and occupations;
- b) the education and training requirements in the target year. In most cases these estimates are obtained by making certain assumptions concerning the relationship between occupations and education.

2. A separate estimate is prepared of the anticipated supplies of persons with different levels and types of education and training who will be available to fill different occupations.

3. The final step is to bring the estimated requirements and potential supplies together and determine where there are likely to be imbalances. The prospective "shortages" or "surpluses" have implications for education and training policies, as well as for labour market policies.

There are various ways in which the dimensions of these products can be expressed. The first dimension is the level of economic organization. Three major levels can be distinguished: national; provincial or regional; municipal or area. In addition, various subdivisions could also be considered.

A second dimension would deal with the breadth of the definitions of industries, occupations and education. Industry could be defined in terms of broad aggregates such as manufacturing and service sectors, or split up into much finer divisions such as foods and beverages, transportation equipment, health, etc. Similarly for occupations we could deal with professional and clerical categories or we could break these down into much finer measures such as electrical engineers, primary school teachers, stenographers and typists, etc. In the case of education we could take such broad definitions as: primary school, high school, university, or we could specify the type of education such as vocational high school, and the subject-matter such as arts degree in university with a major in history.

Time is the third dimension. Should the forecast be for one year in advance or fifteen? As would be expected the implications are quite different.

In addition to the problems of dimension, there is also the question of whether we are forecasting what is likely to happen if things continue along the trend of some period in the recent past; or whether we want to forecast what the economy could accomplish assuming we fully utilize the human and capital resources which will be available.²

Even with this very brief listing of the things which manpower forecasts can measure the reader will certainly appreciate the wide variety of combinations which can be contained in a manpower forecast. The implication of setting out the meaning of manpower forecasting in these terms is that certain decisions have to be made in order to determine the type of manpower forecast which is desired. These decisions, in turn, have to be related to the ultimate objective or reasons for undertaking a forecast.

11 REASONS FOR EMBARKING ON A MANPOWER FORECAST

Just as there are different ways of expressing the results of manpower forecasts, so also there are different reasons why we would want to obtain a manpower forecast. Eight such reasons can be given. These reasons, in turn, are based on five underlying assumptions.

The reasons for embarking on some form of manpower forecasting can include one or more of the following: 3/

1. To develop information on the changes which will have to occur in educational and training facilities to meet the nation's (or the province's or municipality's) future need for educated and trained manpower.
2. In the case of specific groups of workers the objective is to help in the development of policies with respect to these occupations, for example, recruitment, salaries, supporting personnel.
3. To enable preventative action being taken in cases where large manpower dislocations are anticipated as a result of technological change, shift in demand for products, depletion of resources, etc.
4. Similarly manpower forecasting can be related to efforts to assist the development of certain depressed regions or occupations, or as part of an anti-poverty program.
5. Another important objective of manpower forecasting is to provide information for use in the guidance of young people in school. In the United States this was the major objective behind the first manpower forecasting program.
6. Defense mobilization planning can make use of techniques of estimating manpower requirements and supplies.
7. Manpower forecasting can provide the means to assess the implications of attempting to provide certain standards of service. For example, what would be the manpower implications of lowering the pupil-teacher ratio. Manpower forecasting can also be of assistance in curriculum planning. 4/
8. Finally, of particular importance to a country like Canada which has drawn so heavily on imported labour, is the necessity to view the country's anticipated manpower needs not only with respect to domestic education and training programs but also in relation to considerations of immigration and emigration.

Underlying these reasons are certain assumptions of a political, economic and social nature.

1. Canada will continue to be a mixed free-enterprise economy with a democratic rather than totalitarian political system. In this context it is assumed that there will continue to be private and personal decision-making. This is particularly relevant to the role of vocational guidance which presumes that individuals choose their occupations or career paths. In this case manpower forecasting is viewed as providing additional information to persons making a selection of careers and thereby directly helping to make the market for labour more perfect.

2. As the Canadian economy develops there will be a general or overall increase in the need for more highly trained and educated persons. Most studies of the relationship between economic development and educational level of manpower have found positive correlations. 5/ If this assumption is unreasonable then there would be no point in discussing investment in education in relation to economic growth.

3. In addition, however, this doesn't mean that any type of education or training will meet the manpower needs for economic development. There still remains the problem of allocating scarce resources among different types of education and training. Only in a society in which there is no such thing as relative scarcity of goods and services can misallocations of resources be ignored.

4. Since the lead-time for training and educating high talent manpower is great, it is assumed that by improving our ideas concerning what types of people will be needed we can thereby invest more wisely. Given the increasing proportion of Gross National Product that is going into the education sector these decisions assume increased importance. 6/

5. Not only will a knowledge of future manpower needs be of assistance in investing in capital facilities and training teachers, it is also important in advising and providing more information for students as well as persons seeking retraining.

These reasons plus the assumptions that underlie them provide the rationale for preparing manpower forecasts.

We turn now to method of manpower forecasting.

III HOW TO PREPARE A MANPOWER FORECAST

The scientific approach to the question of manpower forecasting would suggest the following three steps:

1. Know the initial state of the manpower situation in detail.
2. Have a set of rules or laws which control the ways in which manpower requirements, supplies and thereby employment can change.
3. Apply these rules to certain expected changes in one or more of the variables to obtain a forecast.

Before we examine the adequacy of our knowledge of the initial state and the expected changes in certain variables (Steps 1 and 3), let us present the economic laws which explain how employment of different factors of production, including different types of labour, is determined.

The Economic Laws or the Theory of the Determination of Employment of Different Factors of Production (including various types of labour)

According to economic theory, the following three elements interact to determine the extent of employment of different factors of production: 7/

1. The level and distribution among industry sectors of the aggregate demand for goods and services.

This means we should know how much money will be spent on the different types of commodities the economy can produce and what this spending means for the output of each industry. In order to determine the distribution to total spending, we need to know the demand schedules for all products (both domestic and foreign demand) and we also have to know the relative prices of the products within the economy as compared with delivered prices (and availability) of these products from other countries.

2. A second consideration is the production function of each industry.

By production function, we mean the technical relationships between the various factor inputs (resources, labour, capita, enterprise) and outputs of goods and services. In very few cases is there a unique relationship between a certain level and type of output and the combination of factor inputs. Most goods and services can be produced in a variety of ways using a variety of combinations of the factors. For example, the basement of a house can be excavated by ten men, each with a shovel and working one day; or by one man operating a power shovel and working two hours. 8/ Which combination do you use? The answer depends on the third consideration.

3. Relative prices of the different factors of production.

In the case of Canada, we answer the question that was just posed by using the power shovel. In India they would likely use the ten men. The prices of capital equipment are relatively lower in Canada than in India, or what is the same thing, the price of labourers relatively higher in Canada.

How do technological changes affect the determination of employment as set out by the three elements? There are many types of technological changes such as new products, new materials as well as new processes. The latter type includes the familiar concept of automation. Let us consider the last type of technological change where it is designed to improve the efficiency or reduce the cost of producing a given product whose quality will remain the same.

The initial impact of such a change in technology is to alter the production function of the particular industry, that is, the effect is on the relationship between the factor inputs and the output. In Canada, labour is relatively more expensive than capital. As a result, technological changes often attempt to economize on the use of labour. The result is to raise the amount of output per person. Does this necessarily mean that employment will decline

in the particular industry and the economy? The answer depends on the interaction of our three elements: total demand for goods and services and the distribution of demand among industry sectors; relative prices of all factors of production; and the production functions including the new production function in our selected industry. Until we can measure all three elements we cannot say a priori what the ultimate employment effect will be.

To what extent are we able to provide statistical data to satisfy the three steps which comprise the scientific approach to manpower forecasting? Let us consider each step separately, taking into consideration the various demensions of manpower forecasting which were set out in Part I of this paper.

1. Knowledge of the initial or present manpower situation.

The largest amount of statistical data is available for the national (Canada) level, however, even here the information is far from complete. For example, there are some serious gaps in the data on employment by detailed industry. The service sector, which employs approximately one quarter of the total labour force is only covered in bits and pieces. The monthly Labour Force Survey publishes only the total for this sector. Yet the component of this sector includes such divergent areas as education and amusements.

The decennial census is the only complete source of detailed occupational data. This means that once every ten years we are given a comprehensive look at the occupational structure of the labour force, and even this snapshot view is marred by certain inherent problems from a manpower point of view. The monthly Labour Force Survey only provides data on the dozen or so major occupation (and industry) groups.

Education data cross-clzssified by industry and occupation are only available from the decennial census. Even this data is limited in its usefulness because it only indicates the years of formal schooling and the level of schooling, that is, primary, secondary and university. There are virtually no statistics on length and type of training or experience received outside the formal school system.

Other aspects of the knowledge of the current situation include data on manpower supplies (employed and unemployed) as well as job vacancies. Unemployment data are available from the Labour Force Survey on the same basis as the employed mentioned above. Vacancy data by occupation and industry are prepared monthly by the National Employment Service as part of their operational work, but these statistics are only available for restricted use inside the federal government. A recent conference on job vacancy statistics has raised the question of whether statistics derived from operational work can be effectively utilized in manpower research. However, it still should be possible for the N.E.S. to provide some meaningful manpower data.

To summarize our knowledge of the current manpower situation at the national level we could say that our information is spotty preventing us from obtaining a truly comprehensive picture.

Our knowledge of the national manpower situation is far greater than what we know about the provincial and municipal levels. In terms of the occupation and education dimensions we have virtually no statistics outside the decennial census.

This dearth of data at the provincial and municipal levels has important implications for the anti-poverty program. Before we can examine future manpower requirements and supplies in particular areas we must have statistics on the present situation. In most cases such data are almost non-existent.

2. Information needed to fit the different parts of the theoretical framework which underlies the determination of employment of different factors of production.

At the national level, as a result of the National Accounts, we do have knowledge of total spending and its distribution among industry sectors. However, it is difficult to quantify the theoretical concepts of demand curves for the products of different industry sectors (both domestic and foreign).

Provincial output data are also available for certain industry sectors but there are many serious gaps as well. At the municipal level such data are non-existent. The only information which could be utilized would be company output or sales figures where one or a few firms made sizeable contributions to the total output (and employment) of a town or area.

Although it is conceptually possible to think of a production function for an industry it is difficult to quantify. We can make crude approximations using output-labour or output-capital ratios as well as simple equations with a few variables. Only at the level of the firm could more complex statistical relationships be obtained relatively easily.

More information is available on relative prices of factors of production but here we run into a host of problems which affect the usefulness of the data in terms of the theoretical laws. For example, the prices of labour, that is, wage or salary rates, reflect a maze of factors such as: length of service, type of education and training, geographical location, industrial attachment, etc.

3. Estimating changes in certain variables.

It can be seen from the foregoing that we are bound to be confronted with serious problems when we move from an imperfect knowledge of both the present situation and how it arose to an attempt to take the anticipated changes in certain variables and try to determine their manpower implication.

However, in spite of the inherent difficulties attempts to forecast manpower requirements and supplies are being made. We turn now to the methods by which such estimates are obtained.

The Present State of the Art of Manpower Forecasting

One particular method of forecasting manpower requirements is more widely used than any others and this method will now be discussed. Various other approaches have been and are being tried but they are only used in a few countries either because of lack of sufficient statistics or because the basis is too crude. 9/ The technique we will discuss here is sometimes referred to as the "Productivity" method. In our discussion, we will refer to this method as: Output, Productivity, Industry-Occupation Matrix or OPIOM for short.

The OPIOM method is being used at the present time, with only slight variations, to project manpower requirements in the United States. 10/ Canada, 11/ and in the six country project of the Organization for Economic Co-operation and Development (OECD). 12/

This method is used to estimate employment in a range of different occupations. The technique is to estimate separately each of the three components: output, productivity, and industry-occupation matrix. Each of these will be examined in turn.

1. Output

An estimate is prepared of the total output for the economy and the output of each industry sector. These estimates can be obtained either through past trends, the establishment of targets or through a mixture of these approaches.

2. Productivity

This component consists of estimates of output per person (or per man-hour) in each industry sector. These figures can be obtained from the examination of past trends; the establishment of targets; "best practice" approach, that is observing the productivity rates in the most advanced firms; or finally by observing developments in other countries.

It should be noted that what may appear to be small differences in productivity, for example, one percentage point per annum, are really huge and have tremendous implications for output and employment.

3. Industry-occupation matrix

These data show the percentage distribution of different occupations within the total employment of each industry. Such estimates can be prepared along similar lines as in the previous two components.

In setting out the three components of the OPIOM method we have omitted any reference to measuring the impact of various technological changes. In the earlier theoretical discussion we indicated that there are certain types of technological changes, some of which, such as automation, primarily affect the production function of an industry. In terms of our components here this would mean that both the productivity figure and the industry-occupation percentages would be affected. Other types of technological changes such as new products or new materials could primarily affect output. The difficulty is to measure the implications of such changes. To the best of our knowledge there are virtually no studies which have attempted to quantify the impact of technological changes. Most research in the area is of a descriptive or qualitative nature. As a result, aside from very specific studies in individual firms, it is not possible, presently, to measure the overall impact of different types of technological changes. 13/

The three components are combined as follows: dividing the output estimate of each industry by the productivity estimate gives the employment in each industry in the target year. Multiplying the results by the industry-occupation matrix produces an estimate of the number of persons who will be employed in each occupation within each industry. By means of addition the total for each occupation can be obtained.

4. The final step on the manpower requirements side would be to convert the estimates of employment by occupation into education and training terms. This requires some judgement and evaluation of the types of education and training needed for different occupations.

Several questions arise when we attempt to move from occupations to education. We want to measure the actual level of education of persons presently in the occupation? Do we want to get an idea of the levels of education that are required for those being hired now, or do we want to estimate what levels of education and experience will be required at some date in the future? These are especially difficult questions to answer because hiring standards are not independent of the types of persons that are available at any one time. In effect, supply can influence the education side of manpower requirements.

Once the manpower requirements are obtained these should be put alongside estimates of future manpower supplies. Here again, several techniques can be used, each based on certain assumptions. The considerations which enter into the determination of manpower supplies are the following:

- a) number of persons currently in the occupation who are expected to remain in the occupation up to the target year;
- b) graduations and other types of training suitable for the particular occupation;

- c) net additions from other occupations within the labour force;
- d) net additions as result of immigration and emigration.

The usual procedure is to estimate supply primarily on the bases of a) and b) with some rough figure for d). It is extremely difficult to measure inter-occupational flows.

Juxtaposing estimated manpower requirements and manpower supplies indicates the nature and type of manpower imbalance. If the forecast of requirements in certain occupations exceeds the anticipated supplies, it would seem to indicate that the supply be increased. This has policy implications for education and training as well as for the labour market.

The OPIOM Method in Relation to the War on Poverty

The forecasting techniques outlined in the preceding section deal with the national level. However, for the most part, poverty programs are concentrated in certain areas or municipalities. What methodological changes should be made in order to focus the research on a much smaller scale?

Very little if any changes in methodology have to be made. In fact, this is one of the virtues of the OPIOM approach. The same conceptual framework involving estimates of output, productivity and industry-occupational matrix, can be applied at the provincial, municipal and even at the firm level. The only qualifications we would add are that inter-area movements of labour and capital can affect both manpower requirements and supplies, and the impacts are likely to be greater the narrower the level of economic organization.

Having set out the methodology we now turn to the applications of manpower forecasting and its limitations.

IV APPLICATIONS OF MANPOWER FORECASTING

What use can be made of the results of a manpower forecast? To begin with we present a general comparison of manpower forecasting and weather forecasting. Following this is a summary of the types of manpower forecasts which have been attempted at different levels of economic organization. The section concludes with a discussion of the application of manpower forecasting techniques to anti-poverty programs.

Manpower Forecasting and Weather Forecasting

Manpower forecasting is one of the newest areas of systematic projections into the future while forecasting the weather is one of the oldest. As an introduction to the application of manpower

forecasting it should be instructive to compare the two types of forecasts. 14/ Most weather forecasts deal with one or two days in advance. A long-range weather forecast is one month ahead at the most. By contrast in the case of manpower forecasting a long-range prediction is anywhere from ten to fifteen years. A second point of difference is in the nature of the elements which interact to produce the final results. In the case of the weather the behaviour of each individual element is fairly predictable; the problem is to determine the relative strengths and the inter-relationships. For manpower forecasting much of human action and reaction is unpredictable, furthermore, the number of factors which can affect the final outcome may be as great or even greater than in the case of the weather. Lastly, a forecast of tomorrow's weather will have no effect on what type of weather we actually have. In the case of manpower forecasting the forecast itself can have an impact on the final outcome and, in fact, it is likely that the reason for undertaking a forecast is to do just that. When one considers that weather forecasts 24 hours in advance are often inaccurate, then one should make some allowance for the results of the much more crudely based manpower forecasts.

The following types of manpower forecasts have been undertaken:

1. The National Level

For the most part, manpower forecasts for an entire nation have taken a very general form dealing with broad groupings of industries and occupations. For example, the much publicized "black book" in the United States, Manpower-challenge of the 1960's, projected requirements to 1975 with total employment requirements divided among the nine major occupations groups and eight major industry groups.

The broad groupings can be translated into education levels but on a reasonable basis this can only be done in general terms, that is, primary, secondary and university education. Such questions as the following can be dealt with at the national level: a) Are there likely to be any significant shifts in the requirements for the different major types of occupations? For example, do we expect the requirements for unskilled labourers to shoot ahead rather than continue their long-term decline? If this were to happen many graduating students might find that the largest number of job openings were in unskilled labour; b) Which occupation groups are expected to grow the most or the least during the forecast period?

In addition to manpower forecasts at the broad industry and occupation level, attempts could be made to deal with more specific occupations, for example, electrical engineers as opposed to professional and technical occupations as a whole. The more specific one becomes at the national level, using the methodology set out in the previous section, the less reliable the results are likely to be. Here the assumptions which underlie the basis for forecasting become more tenuous.

If one wants to project requirements in a few selected occupations alternative methods might be adopted. For example, Dr. William Dymond has suggested that occupations be identified and separated into two types: those which are population based and those which are technology based. 15/ An approach based on the first type of relationship was followed by Professor Judek in his study of medical manpower requirements for the Hall Commission. 16/ However, if one wanted to use this technique for a large number of specific occupations the amount of work would be prohibitive.

On this basis it would seem that general manpower trends can be established at the national level but that increasing difficulties are encountered as one attempts to become more specific.

2. The Provincial or Regional Level

At the provincial level it is theoretically possible to produce more detailed estimates. At this level one can take account of provincial differences and variations in output patterns, productivity and industry-occupation matrices.

The major difficulty is that serious data limitations pose a real problem here. The provinces only have output data for some selected industries and without output data one can only guess at productivity figures. For statistics on and education the only comprehensive data that can be utilized are based on the decennial population census.

A further complicating factor is the question of inter-provincial flows of persons and industries.

If these difficulties can be surmounted, manpower forecasts at the provincial or regional level could be undertaken and could be quite useful. Many individual States in the United States have prepared their own manpower forecasts.

3. Municipal and Area Forecasts

Quite specific estimates can be made for certain industries and occupations, especially in areas where only a few firms or industries are involved. However, offsetting this advantage is the fact that problems of geographical mobility of both labour and capital loom very large.

In the United States, a program has been launched to survey manpower needs in a number of areas within different States. The reliability of these estimates depends in the final analysis on the research which has been conducted by the companies or government agencies in the different areas. It has been mentioned that the same basic approach can be followed at any level of economic organization. In the case of a municipality the results depend upon whether firms themselves link their capita; projections and sales projections to manpower requirements.

Manpower Forecasting and Anti-Poverty Programs

The anti-poverty campaign consists of a series of programs which are designed to fight poverty in certain local areas and municipalities. In the first instance, the role of manpower forecasting is to determine what the potential job opportunities are likely to be in the selected local areas or municipalities. On the basis of these estimates decisions can be made regarding education and training as well as questions of mobility and labour market policy.

If the local area or municipality is one in which only a few firms are present then, unless there are reasonable prospects of new firms and industries entering the area, the manpower forecast must be based on the firm (or firms) requirements.

Although the methodology for undertaking the projection is the same as the three-component plan presented earlier there is one fundamental difference. Whereas at the national and provincial levels it was presumed that the researcher was able to obtain data from published sources (or by special preparation), in most cases at the area or municipality level, the researcher must rely on the estimates prepared by the firm of their manpower needs. Unless the firm itself is following the three steps method or some variant, the results are likely to be extremely tenuous and based only on intuitive "feel" of the future situation.

Ironically and sadly, although most firms prepare sales forecasts, few translate these estimates into manpower requirements. Potentially the most accurate estimates should be available since at the firm level one can come close to the theoretical concept of the production function.

Although a manpower forecast of an area must rely in most cases on the outlook prepared by firms there are benefits to be derived from attempts to examine the current economic situation especially from the supply side. This would include looking at the types of persons presently being used. Since every area has a different pattern of industrial composition the occupational patterns are likely to differ as well.

An assessment of the current situation is bound to provide a net gain in knowledge even though the manpower forecasts may be tenuous.

Manpower forecasts can be useful in connection with efforts to fight poverty because such research a) sheds some light on the current situation, and b) can provide some indication of the general direction of changes and some likely areas for expansion. In the final analysis the contribution of manpower forecasting depends on the availability and reliability of current as well as projected data.

As a closing note in this section a word of caution should be offered. Area manpower forecasts should be integrated or at least looked at in the light of similar forecasts at the provincial and national level. Professor Margaret Gordon observes that there is a danger of "...overemphasis on identification of current labor shortages in local labor market areas as opposed to broader regional or national needs. In this connection, perhaps the most provocative section in OECD examiners' report suggests that U.S. retraining policies may be excessively oriented toward 'the mitigation of hardships arising from unemployment' rather than toward 'the promotion of economic growth.'" 17/

V LIMITATIONS OF MANPOWER FORECASTING

Given the present state of the arts there are certain limitations inherent in manpower forecasting. To begin with "neither individual employers nor professional investigators are able to foresee the implications of new scientific developments." 18/ A second shortcoming is that the technique most widely used does not take into account wage and salary levels in the different occupations. This means that no allowance is made for possibilities of substitution among occupations or between labour and capital which might arise from changes in relative factor prices. Economic theory would postulate that as wage rose in one occupation relative to another, efforts would be made to substitute the cheaper for the more expensive. Yet in all manpower forecasts that I have seen relative wage rates are assumed to be given and constant. 19/ This omission can be particularly serious if one is dealing with an occupation that policy-makers would like to see grow but which is poorly paid relative to occupations which require a comparable training period.

A third difficulty in manpower forecasting relates to the availability and quality of statistics. We have already indicated the areas where there are data limitation including the provincial level where few output statistics can be obtained and the municipality level where the gaps are even greater.

In the case of the anti-poverty program, where the concern is with certain firms in an area, the degree of reliability of current and projected figure is even more crucial. It would be desirable if firms did prepare their own manpower projections using, for example, the three-stop approach outlined earlier as a link between their sales projections and manpower requirements.

A fourth point is that any manpower forecast is the result of certain assumptions and estimates which are based on a particular set of circumstances. Changes in any one or more of the circumstances are likely to produce a change in the forecast. For this reason manpower forecasting has to be viewed as a continuing process rather than a one-shot affair. For example, the Federal Department of Labour in their study for the Gordon Commission entitled "Skilled and Professional Manpower in Canada 1945-1965"

estimated that in 1965 the percentage of the labour force in "skilled" occupations would be 17 per cent as compared with the figure of 15 per cent in 1951. 20/ The actual figure for 1961 was 14½ per cent - a decline from 1951. Now it is true that 1961 was a recession year, but it is unlikely that today the figure would be as high as the earlier estimate. Certain factors have changed in the intervening years. This doesn't mean that the Department of Labour was "wrong" and should not have attempted a forecast. Rather the implication is that the estimates should have been revised in the light of conditions.

VI CONCLUSIONS

On the basis of the foregoing material several conclusions can be drawn:

1. There are many types of manpower forecasts depending on the level of economic organization and the levels of definition of industries, occupations and education.
2. Different combinations of these elements can be used in response to different needs. This is as true of the application of manpower forecasting techniques to the anti-poverty program as it is of manpower forecasting in relation to the general economic development of Canada as a whole.
3. Manpower forecasting can provide a more enlightened approach to policy-making - presumably this is one of its objectives. However, in the final analysis, the policy decisions depend on the assumptions that are made as to the needs of the economy and the methods by which these needs can be met.
4. Attempts to forecast manpower requirements and supplies produce side benefits in an increased understanding of the economic situation in the particular area or sector of the economy which is being studied.
5. Efforts are needed to provide additional measures of the current manpower situation especially with regard to occupational structure and education and training experience.

Before one can forecast the future a detailed knowledge is required of the present manpower picture. Although the monthly Labour Force Survey does shed a lot of light on the picture more detailed information is required. To pursue our comparison of manpower forecasting and weather forecasting, we find that weathermen obtain readings several times a day in dozens of spots across Canada. Perhaps by some means we should increase the frequency of sampling the manpower situation and also provide greater detail in what we are measuring.

The Economic Council of Canada has suggested that the National Employment Service could play an important role in providing additional labour market information for use not only at the national level but also for regional and local areas. 21/ In effect the N.E.S. could perform the function of a manpower weather bureau.

6. More advanced methodology will eventually be useful in manpower forecasting but right now we feel that the major emphasis should be concentrated on improving and gathering together the available statistics which can be utilized in the type of framework outlined in the section on forecasting methodology.

FOOTNOTES

- 1/ A recent article in The Labour Gazette (September, 1965) defined the "war on poverty" as the co-operation and the co-ordination of the following five programs: the Area Development Program, the Manpower Mobility Program, ARDA (Agricultural Rehabilitation and Development Administration), the Canada Assistance Plan and the Company of Young Canadians.
- 2/ The goals set out in the First Annual Review of the Economic Council of Canada are actually a mixture of both the trends and potential approach.
- 3/ Many of these reasons are cited by Mr. Sol Swerdloff in his paper Research Needs and Problems in the Field of Manpower Forecasting prepared for a meeting of the Sub-Committee on Research of the National Manpower Advisory Committee, Airlie House, Warrenton, Virginia, September, 1965.
- 4/ For example see paper by Mr. C.A. Pearce, Director, Division of Research and Statistics, New York State Department of Labor, Need for Manpower Information in the Field of Occupational Training and Education, June, 1965.
- 5/ For example see F.H. Harbeson and C.A. Myers, Education, Manpower and Economic Growth, Strategies of Human Resource Development, Toronto: McGraw-Hill, 1964, Chapter 3.

There is also a large and growing volume of writing on the subject of investment in human capital.

- 6/ See J.P. Francis, Observations on Economic Growth Prospects for Canada and the Problem of Financing Education, paper presented to the Forty-Second Convention, Canadian Education Association, Fredericton, September, 1965 (mimeographed). Table 11 shows the percentage of net general expenditure by all governments in Canada on education rising from 10.9 per cent in 1954 to 16.9 per cent in 1962. These figures can be contrasted with the share of defence spending which fell from 22.9 per cent in 1954 to 12.6 per cent in 1962.
- 7/ See Noah M. Meltz, Changes in the Occupational Composition of the Canadian Labour Force, 1931-1961, Economics and Research Branch, Department of Labour, Canada, Occasional Paper No. 2, Queen's Printer, Ottawa, 1965 pp. 3-7.
- 8/ Estimates were provided by Central Mortgage and Housing Corporation. The figures are approximate since the answer depends on type of soil.
- 9/ For a discussion of the different techniques see: H.S. Parnes, Forecasting Educational Needs for Economic and Social Development, Paris: O.E.C.D., 1962.

Also see Ozay Mehmet, Manpower Forecasting Techniques and their Application to the Province of Ontario, Ontario Department of Labour, 1965 (mimeographed).

The different techniques include the econometric approach of input-output analysis, productivity method, historical trends, specialized occupations, factor substitution. Input-output analysis is being experimented with in the United States and France but it is an extremely costly and elaborate approach. The most widely used technique is the productivity approach discussed in this paper.

- 10/ Manpower Needs and Resources of the United States 1960-1975, Part 1, Summary of Findings and Implications (preliminary draft), Division of Manpower and Employment Statistics, Bureau of Labor Statistics, United States Department of Labor, May, 1960.
- 11/ Drabble, B.J., Potential Output 1946-1970, Staff Study No. 2, prepared for the Economic Council of Canada, Ottawa: The Queen's Printer, 1965. This study only goes as far as the estimates of employment by four major industry divisions. No occupational data are included. The author of this paper is attempting to add the manpower dimension to Mr. Drabble's estimates. The results will appear in a forthcoming study which is being sponsored by the Department of Labour, Ottawa.
- 12/ The Mediterranean Regional Project includes manpower and education studies of the following six countries: Italy, Greece, Portugal, Spain, Turkey, Yugoslavia. For example see: O.E.C.D., The Mediterranean Regional Project, Country Reports: Italy, Paris: O.E.C.D., 1965.
- 13/ For the outline of a study dealing with the impact of different types of technological changes on the occupational structure of employment, see N.M. Maltz, Technology as a Determinant of Manpower Requirements, an address to the Ottawa Chapter of the Canadian Political Science Association, May, 1962 (mimeographed).
- See also, Technological Trends in 36 Major American Industries, Bureau of Labor Statistics, United States Department of Labor, Washington, March, 1964.
- 14/ In preparing this section on the points of comparison between manpower forecasting and weather forecasting the author benefitted from discussions he had with Mr. Keith T. McLeod, Superintendent, Public Weather Service, Meteorological Division, Department of Transport, Toronto.
- 15/ O.E.C.D. Reviews of Manpower and Social Policies, Manpower Policy and Programmes in the United States, O.E.C.D., Paris, 1964, pp. 81-85.

- 16/ Judek, Stanislaw, Medical Manpower in Canada, Royal Commission on Health Services, Queen's Printer, Ottawa, 1964.
- 17/ Gordon, Margaret S., "U.S. Manpower and Employment Policy", Monthly Labor Review, November, 1964, p. 1320.
- 18/ Bowen, William G., Economic Aspects of Education, Industrial Relations Section, Princeton University, Princeton, 1964, p. 35.
- 19/ For a suggestion of a method whereby earnings could be included in manpower forecasting, see N.M. Meltz, Changes in Occupational Composition, op. cit., pp. 107-109.
- 20/ Economics and Research Branch, Department of Labour, Ottawa, Skilled and Professional Manpower in Canada, 1946-1965, Royal Commission on Canada's Economic Prospects, pp. 94-95. It has been suggested that if the unemployment percentage in 1961 had been at the 1951 level then the "skilled worker" figure would be close to 16 per cent compared with the actual figures of $14\frac{1}{2}$ per cent.
- 21/ Economic Council of Canada, First Annual Review Economic Goals for Canada to 1970, Ottawa: Queen's Printer, December, 1964, pp. 178-179.

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